

*** NOTICES ***

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Utility model registration claim]

[Claim 1] The transformer constituted by being filled up with casting resin so that give a coil to the coil bobbin which has a collar to both ends at least, it has the body of a transformer which incorporated and constituted the core in this coil bobbin, and the insulating protective case which contains this body of a transformer, and the projection which engages with the core of the body of a transformer prepares in the internal side face of at least one side of this insulating protective case which faces each other and the above-mentioned projection may cover in an insulating protective case.

[Claim 2] The transformer according to claim 1 which fitted into the perimeter the insulating protective cover which has the fixed piece which holds the thin-walled part of an insulating protective case from outside to the tongue-shaped piece and end face which are stuck to the internal side face of an insulating protective case while having the hole which the terminal which prepared the thin-walled part in opening of an insulating protective case, and was implanted in the collar of a coil bobbin penetrates.

[Claim 3] The transformer according to claim 1 which is the configuration where the hole where a projection has a taper in the opening side of an insulating protective case, has a flat surface on the flat surface and top face holding the body of a transformer, and penetrates the both sides was prepared, and filled up the hole of the projection with casting resin.

[Translation done.]

BEST AVAILABLE COPY

*** NOTICES ***

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed explanation of a design]

[0001]

[Industrial Application]

This design is related with the transformer used for various electronic equipment.

[0002]

[Description of the Prior Art]

In recent years, it is worked on variously how various electronic equipment copes with it structurally with the improvement in the engine performance by attaching importance also to a dependability side and requiring improvement in safety, vibration-proof, and improvement in the property for fall also in a transformer.

[0003]

In this case, of course, to fall of a device finished product, and vibration, it must be [of the device] life-period-satisfied at the time of transportation of a transformer item, and it must be guaranteed.

[0004]

Hereafter, the conventional transformer is explained using drawing 8 - drawing 10 . Conventionally, after this kind of transformer put the core 3 into the nest and the insulating protective case 4 at the coil bobbin 2 which wound the coil 1, filled up with and hardened the silicon casting resin 5 which mixed the silicone oil and the non-disposition filler, as shown in drawing 9 and drawing 10 , and it soldered the terminal 7 on the printed circuit board 6, it was being fixed to the hole 10 of the chassis 9 of a device on the screw 8.

[0005]

Moreover, about the small transformer, it was attached only with soldering of a terminal 7.

[0006]

[Problem(s) to be Solved by the Device]

Since silicone rubber is the thing of properties, such as being used for metal mold mold release, when what made the silicone oil the subject is first used for casting resin with the above-mentioned configuration, even if it carries out heat hardening, from the first However, since adhesive strength is very weak, At the time of the excessive fall impact in a transformer finished product, or transportation vibration etc. Or when the dimension of the insulating protective case 4 which consists of shaping resin as dependability environmental tests, such as a humidity resistance test and a spalling test, are shown in drawing 9 changes etc., The body 12 of a transformer which had fixed with casting resin separated, moved and escaped from the insulating protective case 4, and came out of it, stress was applied utterly, and it had become the cause of peeling of the crack of the printed circuit board 6 joined by solder to the terminal 7, and a foil. When 66 nylon was especially used for the shaping resin for insulating protective cases, the problem of the dimensional change under a moisture absorption environmental condition having been large, and being easy to

escape had arisen. For example, the rate of a dimensional change at the time of desiccation and moisture absorption serves as a dimensional change it is [dimensional change] 0.5mm when J dimension of the insulating protective case 4 is 50mm those with about 1%, and here, and the path clearance of 0.25mm of one side arises.

[0007]

Moreover, when the body 12 of a transformer was fallen (the direction of A), the insulating protective case 4 bent in the direction of B, and there was a possibility that path clearance might keep arising and might similarly come out.

[0008]

As a cure of omission prevention of this body of a transformer, that it eats away and is hard to move casting resin 5, the heights rib 11 was beforehand formed in the inside of the insulating protective case 4, and it carried out, and in order to press down expansion by the moisture absorption after transformer completion of the insulating protective case 4, the process which makes the insulating protective case 4 absorb moisture beforehand and which is called the so-called gas conditioning was added. Effectiveness was unstable, and a production process and the management of all [** and] increased, and it was hard to make them, and they had a problem also in cost. The conventional transformer had a technical problem in transportation vibration, upgrading to a fall impact, and high-reliability reservation as mentioned above.

[0009]

This design solves the above-mentioned technical problem, and it aims at offering the transformer of the high quality which can aim at improvement in transformer omission reinforcement certainly, and high-reliability.

[0010]

[Means for Solving the Problem]

In order to attain the above-mentioned purpose the transformer of this design The body of a transformer which gave the coil to the coil bobbin which has a collar to both ends at least, and incorporated and constituted the core in this coil bobbin, Casting resin is filled up with and constituted so that it may have the insulating protective case which contains this body of a transformer, and the projection which engages with the core of the body of a transformer may be prepared in the internal side face of at least one side of this insulating protective case which faces each other and the above-mentioned projection may be covered in an insulating protective case.

[0011]

[Function]

In the above-mentioned configuration, the core of the body of a transformer is engaged with the projection of the interior side face of an insulating protective case, the body of a transformer is fixed, fixing association is firmly carried out by the configuration filled up with casting resin so that the above-mentioned projection may be covered in an insulating protective case, and an insulating protective case and the body of a transformer can aim at improvement in omission on the strength of the body of a transformer by it at the time of a fall impact etc.

[0012]

[Example]

Hereafter, one example of this design is explained using drawing 1 - drawing 7 . In addition, in drawing 1 - drawing 7 , the same number is attached about the same part as the part shown in drawing 8 - drawing 10 .

[0013]

The projection 13 which holds the body 12 of a transformer in drawing on the inside side face of the side which incorporates a core 3, considers as the body 12 of a transformer, and faces each other in the body 12 of a transformer while winding a coil 1 around the coil bobbin 2, The rib 14 for making homogeneity fill up with the silicon casting resin 5 which positions and mentions the body 12 of a

transformer later in the center is put in in the insulating protective case 4 which it has partly. After being filled up, hardening the silicon casting resin 5 which mixed the silicone oil and the non-disposition filler so that the body 12 of a transformer and projection 13 may be covered, and soldering a terminal 7 on a printed circuit board 6, it is fixing to the hole 10 of the chassis 9 of a device on the screw 8.

[0014]

Although the location of projection 13 and dimensions C and D change with the magnitude of the insulating protective case 4, or reinforcement which are demanded, when the body 12 of a transformer is put in from a top like drawing 2, the side face of the insulating protective case 4 bends outside and the location of the body 12 of a transformer is decided, it is important for them for projection 13 to be able to hold a core 3, as shown in drawing 1.

[0015]

About a dimension C, since E dimension of the body 12 of a transformer has variation, a certain amount of clearance is needed. Here, in the case of 0.1–0.3mm, when a dimension C is set up small, even if filled up with silicon casting resin 5, there is a possibility of becoming non-filling, the body 12 of a transformer is generated by the backlash, and a dimension check will be needed and it will separate also from insertion of the body 12 of a transformer from the original purposes -- workability gets worse.

[0016]

Moreover, it is necessary to set up more greatly about a dimension D than the bone dry of the insulating protective case 4, and the variation of tolerance of moisture absorption. The dimension F of the insulating protective case 4 is that whose weight of 40mm and the body 12 of a transformer 50mm and G is about 400g. A dimension C 1.0mm, The drop test in the condition of drawing 1 is satisfied with a setup of 0.5mm** of 100G after a humidity resistance test, and a dimension D becomes possible [preventing peeling of the foil on a printed circuit board 6].

[0017]

As shown in drawing 3 (a), (b), and (c), about the configuration of projection 13 moreover, the opening side of the insulating protective case 4 In consideration of the insertion nature of the body 12 of a transformer, consider as the shape of a taper 15, and in the body 12 of a transformer, the improvement in on the strength is obtained, so that the maintenance side 16 is large. If a flat surface 17 and a hole 18 are established in the top face of the maintenance side 16, as shown in drawing 4, silicon casting resin 5 will eat into a hole 18 to the dimensional change of the direction of H, to the dimensional change of the direction of I, a flat surface 17 eats away, and is unified, and the improvement in on the strength is obtained further.

[0018]

Furthermore, while having the hole 20 which forms a thin-walled part 19 in opening of the insulating protective case 4, and a terminal 7 penetrates as shown in drawing 5 – drawing 7 in order to carry out stable improvement of reinforcement and the dimensional accuracy By improving insertion nature to the insulating protective case 4 around, and carrying out fitting of the insulating protective cover 23 which has the fixed piece 22 which holds a thin-walled part 19 from outside to the tongue-shaped piece 21 and end face which are stuck to the internal side face of the insulating protective case 4 It is possible to prevent the dimensional change of the direction of H and the deformation at the time of fall furthermore.

[0019]

[Effect of the Device]

Since the transformer of this design is filled up with casting resin so that the projection which engages with the core of the body of a transformer prepares in the neighboring internal side face in which an insulating protective case faces each other, the body of a transformer fixes and a projection may cover, the fixing unification of an insulating protective case, the body of a

transformer, and the silicon casting resin is carried out, and the effectiveness very of [prevention / transformer transportation vibration, improvement in device fall impact strength, / of the body of a transformer under / various / an environmental test / omission] implementation of high-reliability and high quality is acquired as mentioned above.

[0020]

Moreover, the gas conditioning process of an insulating protective case is lost, and workability and the big effectiveness also in cost are acquired.

[Translation done.]

*** NOTICES ***

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The sectional view of the transformer in which one example of this design is shown

[Drawing 2] The decomposition perspective view of this transformer

[Drawing 3] (a), (b), and (c) are the perspective view showing the important section of this transformer.

[Drawing 4] The sectional view of the important section of this transformer

[Drawing 5] The sectional view of the transformer by other examples of this design

[Drawing 6] The perspective view of the finished product seen from the pars-basilaris-ossis-occipitalis side of this transformer

[Drawing 7] The perspective view of the finished product of this transformer

[Drawing 8] The finished-product perspective view of the conventional transformer

[Drawing 9] The sectional view of the conventional transformer

[Drawing 10] The sectional view of the conventional transformer

[Description of Notations]

- 1 Coil
- 2 Coil Bobbin
- 3 Core
- 4 Insulating Protective Case
- 5 Silicon Casting Resin
- 12 Body of Transformer
- 13 Projection
- 15 Taper
- 16 Maintenance Side
- 17 Flat Surface
- 18 Hole
- 19 Thin-walled Part
- 20 Hole
- 21 Tongue-shaped Piece
- 22 Fixed Piece
- 23 Insulating Protective Cover

[Translation done.]

* NOTICES *

JP0 and NCIP1 are not responsible for any damages caused by the use of this translation.

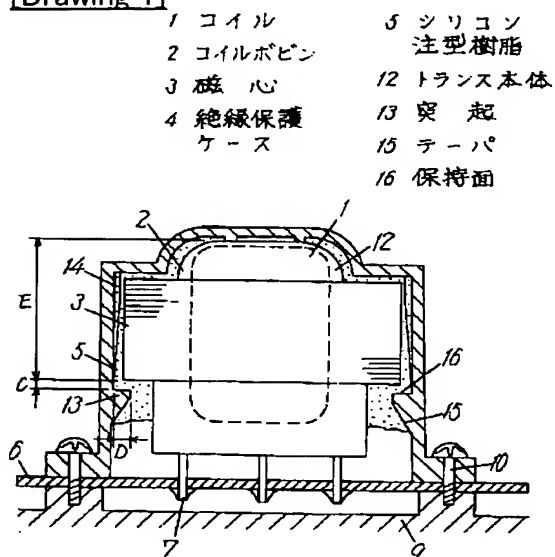
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

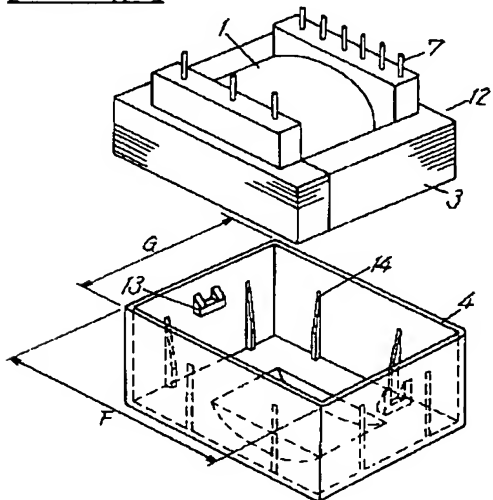
3.In the drawings, any words are not translated.

DRAWINGS

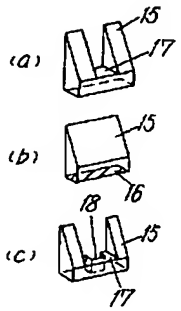
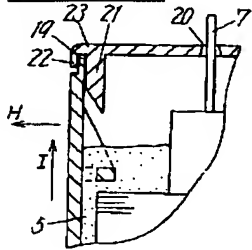
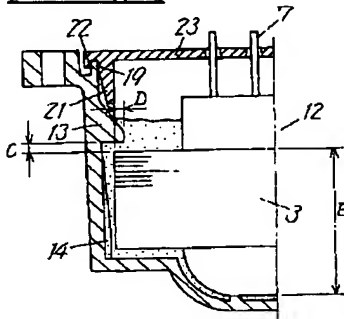
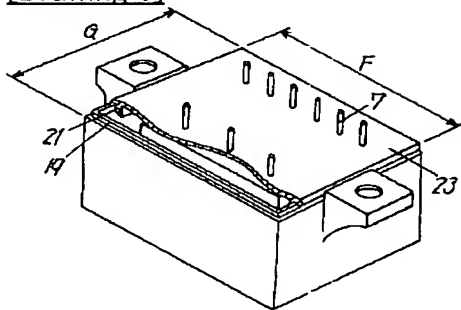
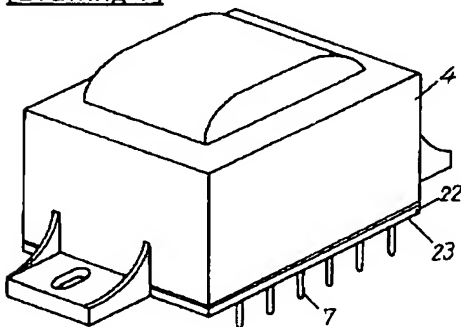
[Drawing 1]



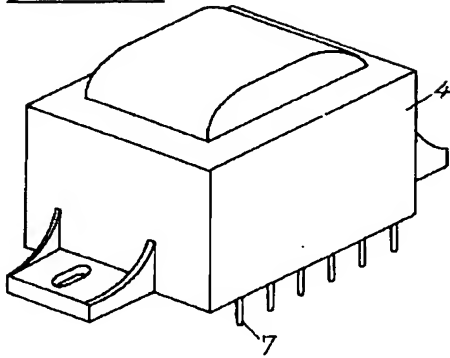
[Drawing 2]



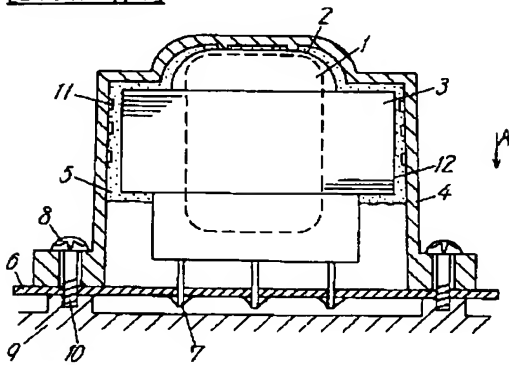
[Drawing 3]

**[Drawing 4]****[Drawing 5]****[Drawing 6]****[Drawing 7]**

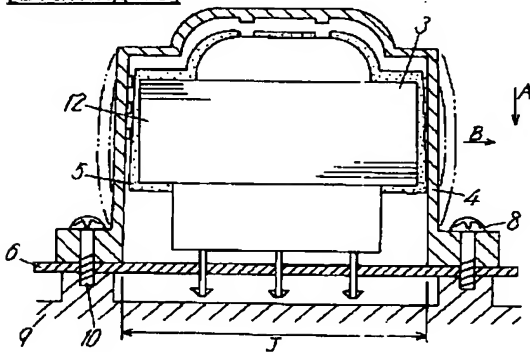
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]

(19)日本国特許庁 (J P)

(12) 公開実用新案公報 (U)

(11)実用新案出願公開番号

実開平6-44117

(43)公開日 平成6年(1994)6月10日

| (51)Int.Cl. ⁵ | 識別記号 | 庁内整理番号 | F I | 技術表示箇所 |
|--------------------------|------|---------|-----|--------|
| H 0 1 F 27/02 | Z | 7135-5E | | |
| 27/26 | M | 8834-5E | | |
| 27/28 | C | 8834-5E | | |

審査請求 未請求 請求項の数3(全 3 頁)

(21)出願番号 実願平4-79542

(22)出願日 平成4年(1992)11月18日

(71)出願人 000005821

松下電器産業株式会社
大阪府門真市大字門真1006番地

(72)考案者 上田 智

大阪府門真市大字門真1006番地 松下電器
産業株式会社内

(72)考案者 梅原 佐登志

大阪府門真市大字門真1006番地 松下電器
産業株式会社内

(74)代理人 弁理士 小鍛冶 明 (外2名)

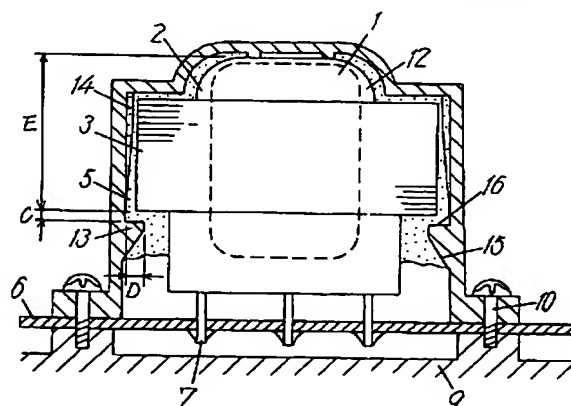
(54)【考案の名称】 トランス

(57)【要約】

【目的】 各種電子機器に使用され、無煙、無発火などの高安全性を要求される樹脂モールドタイプのトランスにおいて、各種環境条件下や落下衝撃時のトランス抜けを防止することを目的とする。

【構成】 コイル1をコイルボビン2に巻回し、磁心3を組込みトランス本体12とし、向かい合う辺の内側側面にトランス本体12を保持する突起13とトランス本体12を中央に固定するリブ14を数個有する絶縁保護ケース4内に入れ、シリコンオイルと無気質フィラを混入したシリコン注型樹脂5をトランス本体12及び突起13を覆うように充填、硬化しプリント基板6上に端子7を半田付けした後、ビス8で機器のシャーシ9の穴10に固定される。

- | | |
|-----------|------------|
| 1 コイル | 5 シリコン注型樹脂 |
| 2 コイルボビン | 12 トランス本体 |
| 3 磁心 | 13 突起 |
| 4 絶縁保護ケース | 15 テーパ |
| | 16 保持面 |



【実用新案登録請求の範囲】

【請求項 1】 少なくとも両端に銚を有するコイルボbinに巻線を施し、このコイルボbinに磁心を組込んで構成したトランス本体と、このトランス本体を収納する絶縁保護ケースとを備え、この絶縁保護ケースの少なくとも一つの向かい合う辺の内部側面にトランス本体の磁心に係合する突起を設け、かつ絶縁保護ケース内に上記の突起を覆うように注型樹脂を充填して構成されるトランス。

【請求項 2】 絶縁保護ケースの開口部に薄肉部を設け、かつコイルボbinの銚に植設された端子が貫通する穴を有するとともに、周囲に絶縁保護ケースの内部側面に密着する舌片及び端面に絶縁保護ケースの薄肉部を外から保持する固定片を有する絶縁保護カバーを嵌合した請求項 1 記載のトランス。

【請求項 3】 突起が絶縁保護ケースの開口部側にテーパを有し、トランス本体を保持する平面と上面に平面を有し、その両面を貫通する穴を設けた形状であり、その突起の穴に注型樹脂を充填した請求項 1 記載のトランス。

【図面の簡単な説明】

【図 1】 本考案の一実施例を示すトランスの断面図

【図 2】 同トランスの分解斜視図

【図 3】 (a), (b), (c) は同トランスの要部を示す斜視図

【図 4】 同トランスの要部の断面図

【図 5】 本考案の他の実施例によるトランスの断面図

【図 6】 同トランスの底部側から見た完成品の斜視図

【図 7】 同トランスの完成品の斜視図

【図 8】 従来のトランスの完成品斜視図

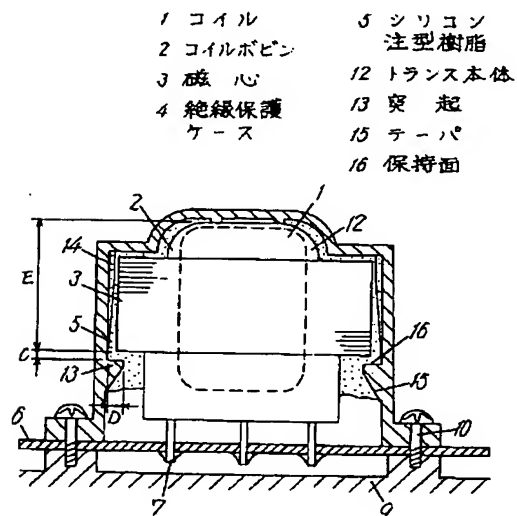
【図 9】 従来のトランスの断面図

【図 10】 従来のトランスの断面図

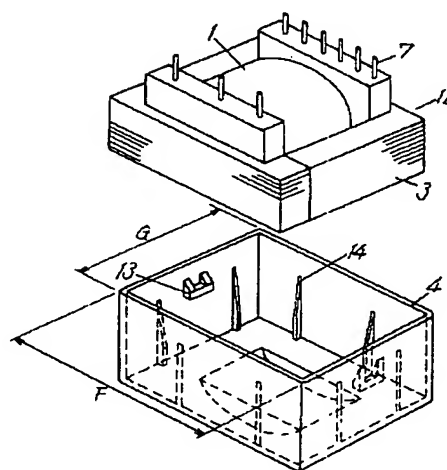
【符号の説明】

- | | |
|----|----------|
| 1 | コイル |
| 2 | コイルボbin |
| 3 | 磁心 |
| 4 | 絶縁保護ケース |
| 5 | シリコン注型樹脂 |
| 12 | トランス本体 |
| 13 | 突起 |
| 15 | テーパ |
| 16 | 保持面 |
| 17 | 平面 |
| 18 | 穴 |
| 20 | 19 薄肉部 |
| 20 | 穴 |
| 21 | 舌片 |
| 22 | 固定片 |
| 23 | 絶縁保護カバー |

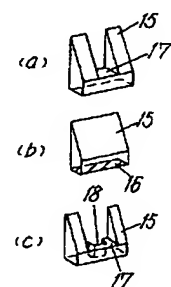
【図 1】



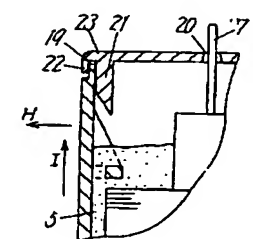
【図 2】



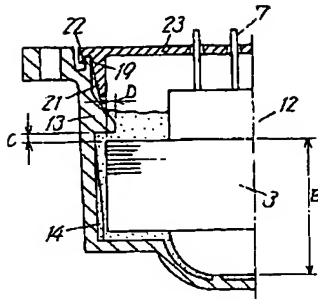
【図 3】



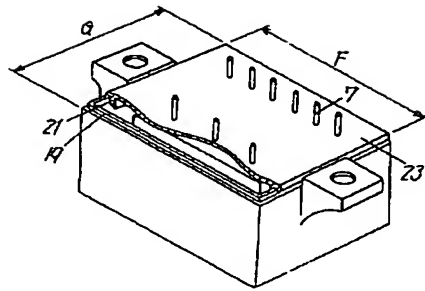
【図 4】



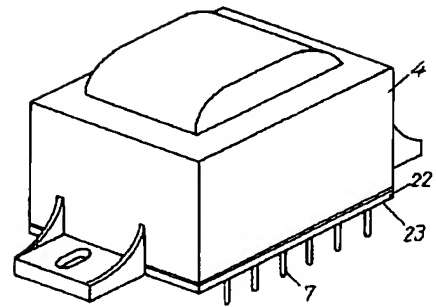
【図5】



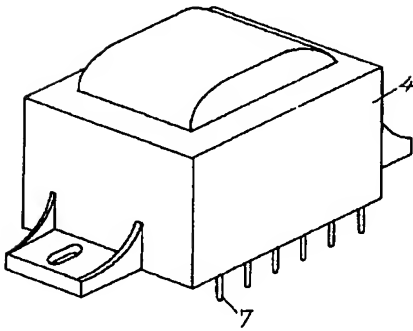
【図6】



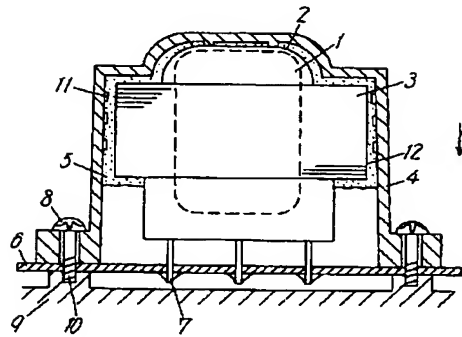
【図7】



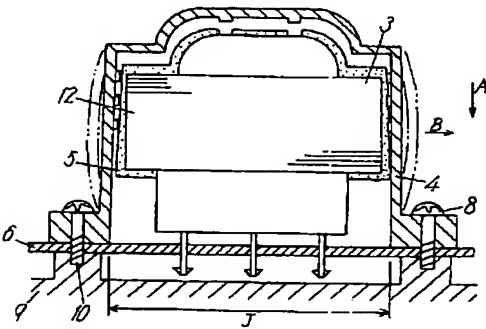
【図8】



【図9】



【図10】



【考案の詳細な説明】

【0001】

【産業上の利用分野】

本考案は、各種電子機器に使用されるトランスに関するものである。

【0002】

【従来の技術】

近年、各種電子機器は性能向上とともに、信頼性面も重要視され、トランスにおいても安全性の向上、耐振動、対落下特性の向上が要求され、いかに構造的に対策を施すかいろいろ検討されている。

【0003】

この場合、トランス単品の輸送時はもちろん、機器完成品の落下、振動に対し、機器の寿命期間満足、保証しなければならないものとなっている。

【0004】

以下、従来のトランスについて図8～図10を用いて説明する。従来この種のトランスは図9、図10に示すようにコイル1を巻回したコイルボビン2に磁心3を組込み、絶縁保護ケース4に入れ、シリコンオイルと無気質フィラを混入したシリコン注型樹脂5を充填、硬化し、プリント基板6上に端子7を半田付けした後、ビス8で機器のシャーシ9の穴10に固定されていた。

【0005】

また、小型のトランスについては、端子7の半田付けだけで取付けられていた。

【0006】

【考案が解決しようとする課題】

しかしながら、上記の構成ではまず、注型樹脂にシリコンオイルを主体にしたものを用いると、もともとシリコンゴムが金型離型用に使われるなどの性質のものであるので加熱硬化しても接着力が非常に弱いため、トランス完成品での過大な落下衝撃や輸送振動時など、または、耐湿試験、熱衝撃試験などの信頼性環境試験において図9に示すように成形樹脂からなる絶縁保護ケース4の外形寸法が変化した場合など、注型樹脂で固着していたトランス本体12が絶縁保護ケース

4から剥がれて動いて抜け出ようとして応力がかかり、端子7に半田接合されていたプリント基板6の割れ、箔の剥がれの原因となっていた。特に、絶縁保護ケース用成形樹脂に66ナイロンを使った場合、吸湿環境条件下での寸法変化が大きく、抜けやすいという問題が生じていた。例えば、乾燥時と吸湿時の寸法変化率が約1%あり、ここで絶縁保護ケース4のJ寸法が50mmの場合、0.5mmの寸法変化となり、片側0.25mmのクリアランスが生じる。

【0007】

また、トランス本体12を落下すると(A方向)、絶縁保護ケース4がB方向にたわみ、同じくクリアランスが生じ抜け出る恐れがあった。

【0008】

このトランス本体の抜け防止の対策としては、あらかじめ絶縁保護ケース4の内面に凸部リブ11を設けて注型樹脂5が食い込み動きにくくしたり、絶縁保護ケース4のトランス完成後の吸湿による膨脹を押さえるため、絶縁保護ケース4をあらかじめ吸湿させておく、いわゆる調湿と呼ばれる工程を付加したりしていた。が、いずれも効果が不安定であり、製造工程および、管理が増えて作りやすく、コスト的にも問題があった。以上のように従来のトランスは輸送振動、落下衝撃に対しての品質向上、高信頼性確保に課題があった。

【0009】

本考案は上記課題を解決するもので、確実にトランス抜け強度の向上が図れる高品質、高信頼性のトランスを提供することを目的とする。

【0010】

【課題を解決するための手段】

上記目的を達成するために本考案のトランスは、少なくとも両端に鏝を有するコイルボビンに巻線を施し、このコイルボビンに磁心を組込んで構成したトランス本体と、このトランス本体を収納する絶縁保護ケースとを備え、この絶縁保護ケースの少なくとも一つの向かい合う辺の内部側面にトランス本体の磁心に係合する突起を設け、かつ絶縁保護ケース内に上記の突起を覆うように注型樹脂を充填して構成したものである。

【0011】

【作用】

上記構成において、絶縁保護ケース内部側面の突起にトランス本体の磁心を係合し、トランス本体を固定し、絶縁保護ケース内に上記の突起を覆うように注型樹脂を充填する構成により、絶縁保護ケースとトランス本体は強固に固着結合され、落下衝撃時などにトランス本体の抜け強度向上が図れる。

【0012】

【実施例】

以下、本考案の一実施例を図1～図7を用いて説明する。なお、図1～図7において、図8～図10に示す部分と同一個所については同一番号を付している。

【0013】

図において、コイル1をコイルボビン2に巻回するとともに、磁心3を組込んでトランス本体12とし、そのトランス本体12を向かい合う辺の内側側面にトランス本体12を保持する突起13と、トランス本体12を中央に位置決めし後述するシリコン注型樹脂5を均一に充填させるためのリブ14とを数個有する絶縁保護ケース4内に入れ、シリコンオイルと無気質フィラを混入したシリコン注型樹脂5をトランス本体12及び突起13を覆うように充填、硬化しプリント基板6上に端子7を半田付けした後、ビス8で機器のシャーシ9の穴10に固定している。

【0014】

突起13の位置、及び寸法C、Dは、絶縁保護ケース4の大きさによって、または要求される強度により異なるが、図2のようにトランス本体12を上から入れ、絶縁保護ケース4の側面が外側にたわみトランス本体12の位置が決まったとき、図1に示すように突起13が磁心3を保持可能なことが重要である。

【0015】

寸法Cについては、トランス本体12のE寸法がバラツキを持つため、ある程度の隙間を必要とする。ここで、寸法Cを小さく設定した場合、例えば、0.1～0.3mmの場合、シリコン注型樹脂5を充填しても未充填になる恐れがあり、トランス本体12がガタツキが発生し、トランス本体12の挿入も寸法確認が必要となり作業性が悪化するなど本来の目的から外れることとなる。

【0016】

また、寸法Dについては、絶縁保護ケース4の絶乾と吸湿の寸法差よりも大きく設定する必要があり、絶縁保護ケース4の寸法Fが50mm、Gが40mm、トランス本体12の重量が400g程度のものです。寸法Cは1.0mm、寸法Dは0.5mm、の設定で耐湿試験後、図1の状態での落下試験は100Gを満足し、プリント基板6上の箔の剥がれを防止することが可能となる。

【0017】

また、突起13の形状については、図3(a)、(b)、(c)に示すように絶縁保護ケース4の開口部側は、トランス本体12の挿入性を考慮してテーパ状15とし、トランス本体12を保持面16は広いほど強度向上が得られ、保持面16の上面に平面17、穴18を設けると図4に示すようにH方向の寸法変化に対しシリコン注型樹脂5が穴18に食い込み、I方向の寸法変化に対し平面17が食い込み一体化され、さらに、強度向上が得られる。

【0018】

さらに、強度、寸法精度を安定向上させるため、図5～図7に示すように、絶縁保護ケース4の開口部に薄肉部19を設け、かつ端子7が貫通する穴20を有するとともに、周囲に絶縁保護ケース4への挿入性を良くし、絶縁保護ケース4の内部側面に密着する舌片21及び端面に薄肉部19を外から保持する固定片22を有する絶縁保護カバー23を嵌合させることにより、さらにH方向の寸法変化、落下時の変形を防止することが可能である。

【0019】

【考案の効果】

以上のように本考案のトランスは絶縁保護ケースの向かい合う辺の内部側面にトランス本体の磁心に係合する突起を設け、トランス本体を固定し突起を覆うように注型樹脂を充填するため、絶縁保護ケースとトランス本体および、シリコン注型樹脂が固着一体化され、トランス輸送振動、機器落下衝撃強度の向上、各種環境試験下におけるトランス本体の抜け防止など、極めて高信頼性、高品質の実現という効果が得られる。

【0020】

また、絶縁保護ケースの調湿工程がなくなり、作業性、コスト的にも大きな効果が得られる。

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.